

REMARKS/ARGUMENTS

This Amendment and Response to Office Action is submitted concurrently with a legible set of replacement references that Applicants previously submitted in an *Information Disclosure Statement* filed March 26, 2003.

In the Office Action dated November 26, 2003 the Examiner: (1) objected to the Information Disclosure Statement; (2) rejected claims 1-6, 9, 12, 13, 16-20, 31-33, 36, 37, 41, 43-50, 53-59, 68, 69, 74, 79 and 80 under 35 U.S.C. § 102(b); (3) rejected claims 7, 8, 10, 11, 14, 15, 21-23, 35, 42, 60, 61, 70-72, 75-78, 81 and 82 under 35 U.S.C. § 103(a); (4) indicated that claims 24-30, 34, 51, 52, 62-64, 83 and 84 are allowable; and (5) allowed claims 38-40, 65-67 and 85-92. Applicants acknowledge with appreciation the allowance of claims 38-40, 65-67 and 85-92, and the allowability of claims 24-30, 34, 51, 52, 62-64, 83 and 84.

Status of the Claims

Claims 7, 8, 13, 19-23, 25-30, 32-34, 37-40, 45-80 and 82-92 are in original form.

Claims 2-6, 10-12, 14-18, 24, 31, 35, 36, 42-44 and 81 are currently amended.

Claims 1, 9 and 41 are canceled.

Objection to the Information Disclosure Statement

The Examiner objected to the *Information Disclosure Statement* filed by Applicants on March 26, 2003 because not all of the references were legible. In response, Applicants resubmit concurrently herewith a legible copy of those references that were not initialed on the PTO-1449 form.

Claim Rejections Under 35 USC § 102(b)

Claims 1-6, 9, 12, 13, 16-20, 31-33, 36, 37, 41, 43-50, and 53-59 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Scherbatskoy, U.S. Patent No. 5,113,379 (hereinafter *Scherbatskoy*). Claims 1, 9 and 41 have been canceled. Applicants respectfully submit that independent claim 3 is patentably distinguishable over *Scherbatskoy* at least because *Scherbatskoy* fails to teach or suggest a downhole receiver that is a pressure while drilling tool, and further fails to

teach or suggest a downhole receiver that measures pressure in the drill string only. Instead, referring to Figure 34 and Column 60, lines 1-12, *Scherbatkoy* discloses a **pressure transducer** 790, rather than a pressure while drilling tool. The transducer 790 is exposed on one side to the pressure within the drill pipe and on the other side to the pressure within the annulus area 66. "Thus, the transducer 790 is subject to the fluctuations of the pressure differential between the interior of the drill string and the borehole annulus." (Column 60, lines 9-12). Therefore, *Scherbatkoy* teaches a transducer 790 that measures differential pressure between two locations, whereas the downhole receiver of claim 3 is a pressure while drilling tool that measures actual pressure in the drill string only. This is a significant distinction because differential pressure measurements allow for a flow rate determination when the size of the orifice between the pressure measurement points is known (*i.e.* a venturi flow meter), whereas actual pressure measurements taken at a single location do not allow for a flow rate determination. Thus, *Scherbatkoy* fails to disclose each and every element of claim 3, which recites a pressure while drilling tool that measures pressure in the drill string only. Accordingly, Applicants submit that independent claim 3 is patentably distinguishable over *Scherbatkoy* and is therefore in condition for allowance.

With respect to independent claim 18, Applicants respectfully submit that this claim is patentably distinguishable over *Scherbatkoy* at least because *Scherbatkoy* fails to teach or suggest a system for generating a signal for communicating with a downhole assembly comprising a **flow diverter** and a **backpressure device**. The Examiner takes the position that the flow divider mentioned by *Scherbatkoy* in Column 9, lines 52-55 is equivalent to the claimed flow diverter. However, referring to Column 58, lines 4-22, the flow divider/separator 726 of *Scherbatkoy* comprises a chamber with a diaphragm 752 disposed therein to separate or divide the chamber into upper and lower fluid compartments. In operation, when the valve 700 is momentarily opened, fluid flows into the upper chamber of the flow separator 726, causing the diaphragm 752 to move downwardly, thereby causing a pressure pulse to move into the stand pipe 24. In contrast, the flow diverter of claim 18 is a streamlined, inline device designed not to separate fluid into different compartments like the *Scherbatkoy* flow divider 726, but rather to reduce fluid velocity as the fluid bypasses the flow diverter.

The Examiner also takes the position that the surge suppressor/absorber mentioned by *Scherbatkoy* in Column 9, lines 52-55 is equivalent to the claimed backpressure device. However, referring to Column 57, lines 23-54, *Scherbatkoy* discloses that the surge absorber 712 is a closed vessel divided into two portions by a diaphragm 718. The upper portion of the surge absorber 712 is

filled with compressible gas 720. In operation, when the valve 700 is momentarily opened, fluid flows into the lower portion 722 of the surge absorber 712, thereby deflecting the diaphragm 712 and compressing the gas 720. When the valve 700 is closed, the fluid pressure decreases, and the gas 720 expands to move the diaphragm 718 back to its normal position. “Thus, the surge absorber evens out the flow of fluid,” *i.e.* the *Scherbatskoy* surge absorber 712 is designed to absorb pressure surges created when the bypass valve 700 is momentarily opened. *Scherbatskoy* also teaches in Column 57, lines 15-24 that “[i]n order to prevent a back pressure developing” the surge absorber 712 is employed instead of a large return pipe 704. In contrast, the claimed backpressure device is designed to maintain sufficient pressure in the bypass line so as to prevent cavitation in other transmitter components. Thus, whereas the *Scherbatskoy* surge absorber 712 prevents a backpressure from developing, the claimed backpressure device ensures that a backpressure exists. Therefore, *Scherbatskoy* fails to disclose each and every element of claim 18, which recites a flow diverter and a backpressure device. Accordingly, Applicants submit that independent claim 18 is patentably distinguishable over *Scherbatskoy* and is therefore in condition for allowance. Additionally, Applicants note that pending claims 2, 4-6, 12, 13 and 16-20 each depend from allowable claim 18. Thus, Applicants respectfully submit that claims 2, 4-6, 12, 13 and 16-20 are likewise allowable over *Scherbatskoy*.

With respect to independent claim 31 and independent claim 37, Applicants respectfully submit that these claims are patentably distinguishable over *Scherbatskoy* at least because *Scherbatskoy* fails to teach or suggest a control system comprising a **computer**. Referring to Column 57, lines 1-12, the “control system” disclosed by *Scherbatskoy* comprises an electrical signal generating circuit 708 and an amplifying circuit 706 that respond to a command signal input 710 to control a valve 700. The command signal is a sequential or binary code that can be initiated at the will of an operator by a switch 710A. Applicants submit that the *Scherbatskoy* command signal input 710, *i.e.* a switch 710A that is manually controlled by an operator to send a command signal to a primitive circuit 706, 708, is not functionally equivalent to a **computer**, which has far more advanced functionality than a simple switch 710A. Thus, *Scherbatskoy* fails to disclose each and every element of claim 31 and 37, which each recite a control system comprising a **computer**. Accordingly, independent claims 31 and 37 are patentably distinguishable over *Scherbatskoy* and are therefore in condition for allowance. Additionally, Applicants note that pending claims 32 and 33 each depend from allowable claim 31. Thus, Applicants respectfully submit that claims 32 and 33 are likewise allowable over *Scherbatskoy*.

With respect to independent claim 36, Applicants respectfully submit that this claim is patentably distinguishable over *Scherbatskoy* at least because *Scherbatskoy* fails to teach or suggest

means for bypassing a substantial quantity of fluid to generate a low frequency signal for communicating with a downhole assembly. Instead, referring to Figure 31 and the accompanying text in Column 57, lines 13-54, *Scherbatskoy* teaches a system wherein the valve 700 is opened “momentarily” such that “a relatively large flow rate of drilling fluid occurs for a short time” (lines 15-18), thereby generating a shock wave type pulse. *Scherbatskoy* also teaches that a surge absorber 712 is employed to even out the flow of fluid so that a small flow rate can exist in the mud return pipe 704, “typically ... no more than a few quarts per minute” (lines 43-48). Further, this “flow rate will typically be sufficiently small, by the use of the surge absorber 712, that a small flexible hose such as a garden hose may be utilized to return the mud to the mud pit” (lines 48-52). Thus, *Scherbatskoy* fails to disclose each and every element of claim 36, which recites means for bypassing a substantial quantity of fluid to generate a low frequency signal for communicating with a downhole assembly. Accordingly, Applicants submit that independent claim 36 is patentably distinguishable over *Scherbatskoy* and is therefore in condition for allowance.

With respect to independent claim 43, Applicants respectfully submit that this claim is patentably distinguishable over *Scherbatskoy* at least because *Scherbatskoy* fails to teach or suggest an **algorithm** for decoding a pressure pulse signal **downhole**. Instead, referring to Figure 34 and the accompanying text in Column 59, line 62 to Column 60, lines 1-25, *Scherbatskoy* teaches that the pressure transducer 790 receives pressure pulses and converts them into electrical signals, which are then passed through a filter 794, an amplifier 796, and a pulse generator 798, which feeds the coil of a stepping switch 795. Therefore, *Scherbatskoy* teaches that the pressure pulses are converted to electrical signals, then filtered, amplified, and transmitted to a pulse generator, but does not teach that the pressure pulses are decoded by an algorithm downhole. Thus, *Scherbatskoy* fails to disclose each and every element of claim 43, which recites an algorithm for decoding a pressure pulse signal downhole. Accordingly, Applicants submit that independent claim 43 is patentably distinguishable over *Scherbatskoy* and is therefore in condition for allowance.

With respect to independent claim 44, Applicants respectfully submit that this claim is patentably distinguishable over *Scherbatskoy* at least because *Scherbatskoy* fails to teach or suggest introducing a series of pressure pulses into a fluid being pumped into a well, wherein each pulse has a duration above the shock wave regime. Instead, as previously described with respect to claim 36, *Scherbatskoy* teaches a system wherein the valve 700 is opened “momentarily” such that “a relatively large flow rate of drilling fluid occurs for a short time” (lines 15-18), thereby generating a shock wave type pulse. Thus, *Scherbatskoy* fails to disclose each and every element of claim 44, which recites

introducing a series of pressure pulses into a fluid being pumped into a well, wherein each pulse has a duration above the shock wave regime. Accordingly, Applicants submit that independent claim 44 is patentably distinguishable over *Scherbatskoy* and is therefore in condition for allowance. Additionally, Applicants note that pending claims 45-50 and claims 53-59 each depend from allowable claim 44. Thus, Applicants respectfully submit that claims 45-50 and claims 53-59 are likewise allowable over *Scherbatskoy*.

Claims 68 and 69 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Tubel* et al., U.S. Patent No. 5,959,547 (hereinafter *Tubel*). The Examiner takes the position that *Tubel* discloses the limitations of independent claims 68 and 69 in Column 15, lines 30-42 describing a borehole transmitter/receiver 52 that can receive commands and data from the surface and transmit data to the surface. Applicants respectfully submit that claim 68 and claim 69 are patentably distinguishable over *Tubel* at least because *Tubel* fails to teach or suggest a method for **drilling a borehole** comprising transmitting a series of downlink instruction signals to a **drilling assembly** and transmitting from the **drilling assembly** a series of uplink data signals in accordance with claim 68 and claim 69. Instead, the transmitter/receiver 52 of *Tubel* is part of a downhole control and monitoring system for **production wells**. Therefore, rather than using downlink and uplink signaling for controlling the operation of a steerable drilling assembly as it drills a borehole, *Tubel* discloses a system for controlling stationary downhole tools permanently installed within wells that have already been drilled and are on production. Thus, *Tubel* fails to disclose each and every element of claim 68 and claim 69, which each recite a method for drilling a borehole comprising transmitting a series of downlink instruction signals to a drilling assembly and transmitting from the drilling assembly a series of uplink data signals. Accordingly, Applicants submit that independent claim 68 and independent claim 69 are patentably distinguishable over *Tubel* and are therefore in condition for allowance.

Claims 74, 79 and 80 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Biglin, Jr.*, et al., U.S. Patent No. 6,105,690 (hereinafter *Biglin, Jr.*). Applicants respectfully submit that claim 74 is patentably distinguishable over *Biglin, Jr.* at least because *Biglin, Jr.* fails to teach or suggest transmitting a computer command from a location **remote from the drilling site** to control a directional drilling operation. Instead, referring to Column 12, lines 55-61, *Biglin, Jr.* teaches using pressure pulsations attributable to the mud pump pistons to communicate steering directions in a steerable drill string from the surface to the bottom hole assembly. “The surface” refers to the location where the drilling rig 1 is located, as shown in Figure 1. Therefore, “the surface” is at the drilling site rather than at a location remote from the drilling site. Thus, *Biglin, Jr.* fails to disclose each and every

element of claim 74, which recites transmitting a computer command from a location **remote from the drilling site** to control a directional drilling operation. Accordingly, Applicants submit that independent claim 74 is patentably distinguishable over *Biglin, Jr.* and is therefore in condition for allowance.

With respect to claim 79, Applicants respectfully submit that this claim is patentably distinguishable over *Biglin, Jr.* at least because *Biglin, Jr.* fails to teach or suggest sending downlink instruction signals **without interrupting drilling** to effect an operating change to any of a plurality of downhole tools. Instead, referring to Column 7, lines 23-55, *Biglin, Jr.* teaches that the pressure pulsation sensor 16 analyzes the pressure pulsations 23 to determine if the mud pump 7 is operating. When the mud pump 7 is operating, no action is taken, but if the sensor 16 determines that the mud pump 7 has ceased operation, it then signals the microprocessor 92 to effect an operating change in the MWD tool. Therefore, an operating change is only effected when the mud pump 7 ceases operation, which necessarily means that drilling has been interrupted. Thus, *Biglin, Jr.* fails to disclose each and every element of claim 79, which recites sending downlink instruction signals **without interrupting drilling** to effect an operating change to any of a plurality of downhole tools. Accordingly, Applicants submit that independent claim 79 is patentably distinguishable over *Biglin, Jr.* and is therefore in condition for allowance. Additionally, Applicants note that pending claim 80 depends from allowable claim 79. Thus, Applicants respectfully submit that claim 80 is likewise allowable over *Biglin, Jr.*

Claim Rejections Under 35 USC § 103(a)

Various of dependent claims 7, 8, 10, 11, 14, 15, 21-23, 35, 60 and 61 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Scherbatskoy*, alone or in combination with either *Montgomery*, U.S. Patent No. 5,331,318 (hereinafter *Montgomery*) or *Mumby*, U.S. Patent No. 4,550,392 (hereinafter *Mumby*). Applicants respectfully submit that *Scherbatskoy*, alone or in combination with *Montgomery* or *Mumby*, does not establish a *prima facie* case of obviousness as to claims 7, 8, 10, 11, 14, 15, 21-23, 35, 60 and 61.

In particular, assuming for the sake of argument that the combination of *Scherbatskoy* with *Montgomery* or *Mumby* is proper (without conceding such), the Examiner has nonetheless failed to establish a *prima facie* case of obviousness as such a combination does not teach or suggest all of the claim limitations. In particular, claims 7, 8, 10, 11, 14, 15, 21-23 and 35 each depend from and incorporate the limitations of independent claim 18. As discussed previously, *Scherbatskoy* does not teach or suggest each and every element of claim 18, and more specifically does not disclose a

system for generating a signal for communicating with a downhole assembly comprising a flow diverter and a backpressure device. Neither of the other cited references, namely *Montgomery* or *Mumby*, is cited by the Examiner for the purpose of showing such a system comprising a flow diverter and a backpressure device, and in any event does not show such a system even if relied upon for such. Accordingly, given that *Scherbatkoy* does not make obvious each and every element of claims 7, 8, 10, 11, 14, 15, 21-23 and 35, and the other references do not make up for the lack of teaching of *Scherbatkoy*, Applicants submit that claims 7, 8, 10, 11, 14, 15, 21-23 and 35 are not obvious in view of the prior art of record.

Similarly, claims 60 and 61 each depend from and incorporate the limitations of independent claim 44. As discussed previously, *Scherbatkoy* does not teach or suggest each and every element of claim 44, and more specifically does not disclose a method comprising introducing a series of pressure pulses into a fluid being pumped into a well, wherein each pulse has a duration above the shock wave regime. Neither of the other cited references, namely *Montgomery* or *Mumby*, is cited by the Examiner for the purpose of showing such a method comprising introducing a series of pressure pulses into a fluid being pumped into a well, wherein each pulse has a duration above the shock wave regime, and in any event does not show such a method even if relied upon for such. Accordingly, given that *Scherbatkoy* does not make obvious each and every element of claims 60 and 61, and the other references do not make up for the lack of teaching of *Scherbatkoy*, Applicants submit that claims 60 and 61 are not obvious in view of the prior art of record.

Independent claim 42 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Scherbatkoy* in view of *Montgomery*. The Examiner takes the position that claim 42 is obvious because *Scherbatkoy* teaches all of the elements except an algorithm that performs an error-checking function, and *Montgomery* teaches a downhole receiver having error-checking capability. In response, Applicants respectfully submit that claim 42 is patentable over the combination of *Scherbatkoy* and *Montgomery* at least because, as described above with respect to claim 43, *Scherbatkoy* fails to teach or suggest any algorithm for decoding a signal **downhole**. Therefore, *Scherbatkoy* fails to teach an algorithm for decoding a signal downhole comprising filtering to generate a filtered signal, cross-correlating to generate a processed signal, and determining the instruction from the processed signal. Instead, the *Scherbatkoy* decoding steps referred to by the Examiner are performed by a computer on the surface that filters, cross-correlates, and otherwise processes uplink signals. This is a significant difference because an operator can easily vary the

uplink signal search options, monitor the uplink signals, and make adjustments for the particular drilling conditions using a computer at the surface, whereas downhole conditions are not easily monitored and adjustments to a downhole algorithm are difficult to make. Therefore, the downhole algorithm must be capable of recognizing signals over a wide range of conditions. Accordingly, Applicants respectfully submit that the combination of *Scherbatetskoy* with *Montgomery* does not establish a *prima facie* case of obviousness as to claim 42.

Claims 70-72 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Tubel* in view of *Biglin, Jr.* The Examiner takes the position that it would have been obvious to use the methods disclosed by *Tubel* to steer a steerable drilling tool as taught by *Biglin, Jr.* Applicants traverse the Examiner's argument and respectfully submit that the combination of *Tubel* with *Biglin, Jr.* does not establish a *prima facie* case of obviousness as to claims 70-72. As discussed previously with respect to claim 69 from which claims 70-72 depend, *Tubel* does not teach or suggest a method for **drilling a borehole** comprising transmitting a series of downlink instruction signals to a **drilling assembly** and transmitting from the **drilling assembly** a series of uplink data signals. Further, while *Biglin, Jr.* discloses the use of a steerable drilling assembly, Applicants submit that there is no motivation to combine the control means of *Tubel*, which is designed to monitor and control downhole tools that are stationary and permanently installed in wells that have already been drilled and are on production, with a method for drilling a well bore involving a moving drilling assembly, encountering changing drilling conditions, and having no permanent downhole infrastructure. Accordingly, Applicants respectfully submit that the combination of *Tubel* with *Biglin, Jr.* does not establish a *prima facie* case of obviousness as to claims 70-72. Further, the Office Action Summary indicates that claim 73 is rejected, but claim 73 is not discussed within the body of the Office Action. Nevertheless, at least because claim 73 depends from claim 72, Applicants submit that claim 73 is also in condition for allowance over the art of record.

Dependent claim 75 and independent claim 76 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Biglin, Jr.* in view of *Tubel*. The Examiner takes the position that although *Biglin, Jr.* does not specifically recite drilling a well borehole from a location remote from the drilling site, *Tubel* teaches controlling a plurality of well bore sites from a remote location, and therefore it would have been obvious to modify the system of *Biglin, Jr.* to include the control means taught by *Tubel*. Applicants respectfully traverse the Examiner's rejection of claims 75 and 76 and submit that there is no motivation to combine the remote signaling means of *Tubel*, which is designed

to monitor and control downhole tools that are stationary and permanently installed in wells that have already been drilled and are on production, with a method for drilling well bores involving a moving drilling assembly, encountering changing drilling conditions, and having no permanent downhole infrastructure. Accordingly, Applicants respectfully submit that the combination of *Biglin, Jr.* with *Tubel* does not establish a *prima facie* case of obviousness as to either claim 75 or claim 76. Additionally, Applicants note that pending claims 77 and 78 each depend from allowable claim 76. Thus, Applicants respectfully submit that claims 77 and 78 are likewise allowable over *Biglin, Jr.*, either alone or in combination with *Tubel*.

Independent claim 81 and dependent claim 82 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Biglin, Jr.*. With respect to claim 81, the Examiner takes the position that although *Biglin, Jr.* does not recite changing the operation by taking a sample using a drilling formation tester, such an operating change is within the scope of *Biglin, Jr.* Applicants respectfully submit that claim 81 is patentable over *Biglin, Jr.* at least because, as described above with respect to claim 79, *Biglin, Jr.* fails to teach or suggest sending downlink instruction signals **without interrupting fluid circulation** to effect an operating change to any of a plurality of downhole tools. Instead, only if the sensor 16 determines that the mud pump 7 has ceased operation will it signal the microprocessor 92 to effect an operating change in the MWD tool. Therefore, an operating change is only effected when the mud pump 7 ceases operation, which necessarily means that fluid circulation has been interrupted. Accordingly, Applicants respectfully submit that *Biglin, Jr.* does not establish a *prima facie* case of obviousness as to claim 81, which recites sending downlink instruction signals without interrupting fluid circulation.

Similarly, Applicants respectfully submit that claim 82 is patentable over *Biglin, Jr.* at least because claim 82 depends from and incorporates the limitations of claim 79. As discussed previously, *Biglin, Jr.* fails to teach or suggest each and every element of claim 79, and more specifically does not disclose sending downlink instruction signals **without interrupting drilling** to effect an operating change to any of a plurality of downhole tools. Accordingly, Applicants respectfully submit that *Biglin, Jr.* does not establish a *prima facie* case of obviousness as to claim 82.

Allowable Subject Matter

Claims 24-30, 34, 51, 52, 62-64, 83 and 84 were objected to as being dependent upon a rejected base claim, but the Examiner stated that these claims would be allowable if claims 24, 34, 51, 62 and 83 were rewritten in independent form to include all the limitations of the base claim and any intervening claims. In response, Applicants have rewritten claim 24, and submit that the remaining claims 25-30, 34, 51, 52, 62-64, 83 and 84 are all dependent from allowable base claims.

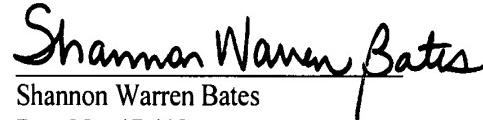
CONCLUSION

Consideration of the foregoing amendments and remarks, reconsideration of the application, and withdrawal of the rejections and objections is respectfully requested by Applicants. No new matter is introduced by way of the amendment. It is believed that each ground of rejection raised in the Office Action dated November 26, 2003 has been fully addressed. If any fee is due as a result of the filing of this paper please appropriately charge such fee to Deposit Account Number 03-2769 of Conley Rose, P.C., Houston, Texas. If a petition for extension of time is necessary in order for this paper to be deemed timely filed, please consider this a petition therefore.

If a telephone conference would facilitate the resolution of any issue or expedite the prosecution of the application, the Examiner is invited to telephone the undersigned at the telephone number given below.

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